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ABSTRACT

On the average, the diet of the elderly in this country is adequate, except possibly in total caloric intake and the intake of calcium. Many deficiencies may exist in specific ethnic, demographic, and economic subpopulations. A number of factors might enter into causing these general and specific problems, of which drug-to-drug and drug-to-food interactions may be supreme. Economic status cannot be ruled out, and there is undoubtedly an entire subpopulation of the aged who cannot afford to exercise because they cannot afford the extra caloric intake. Some diagnosed deficiencies may be remedied by supplements, either in the form of dietary additives or substitutions. Much can be done by teaching proper dietary habits, starting early in life and continuing throughout the years. The combined health, physical education, and recreation professions may be responsible for changing the next generation of elderly by fostering a lifetime of activity and fitness. Active lifestyles, combined with the practice of available nutrition guidelines, as well as compliance with other components of a wellness program, will enhance the quality of life. (JD)

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NUTRITIONAL CONSIDERATIONS FOR PHYSICAL FITNESS IN THE ELDERLY

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NUTRITIONAL CONSIDERATIONS TO LIFE LONG FITNESS -

Fitness cannot be looked at as a unidimensional goal, integral but unrelated to other aspects of a person's life long total well being. Fitness is undeniably interrelated to the level of disease and stress that a person has at any point in time in their life. Possibly more obvious, though, is the symbiotic relationship between nutrition and fitness; the body cannot achieve fitness (that is, receive the optimal benefits of exercise) if the body is not being properly nourished. For years we have preached that fitness (and now we are using the buzzword wellness) may increase both the quantity and the quality of life. If we do indeed believe this to be true, then we should reap both immediate and accumulated rewards of fitness in old age. We all believe then that proper exercise and nutrition will leave us looking like 25 year old's! But of course we know that isn't the case. Wellness is not a fountain of youth which will stop the aging process. We can't work miracles for the aged with nutrition and exercise; but we can maximize their abilities and provide them with a more enjoyable life. To do this, they must be properly nourished. I would like to address this question of nutrition and fitness by first taking a look at the current nutritional status of the elderly, because they must be properly nourished to safely begin and continue an exercise program. Therefore we must get some idea of the problems they now face. Second, if there are nutritional problems in the elderly, how did they get that way; for to eliminate the symptoms we must examine the etiology. The third, what can be done to change any problems we may find, and are any of these solutions within the realm of our profession to try to change.

Most of us have preconceived notions about aging. We know that the aging process characteristically displays certain degrees of physiological changes, such as decreased cardiac output, loss of lean body mass, etc. (Table 1).

And, either consciously or unconsciously, most of us expect certain symptomatic changes to take place, such as anxiety, depression, memory loss, etc. (Table 2). The sources of the physiological and personality changes are certainly not clearly understood. Is it possible that inadequate nutrition may play a role? Well, we can see from Table 3 (potential vitamin deficiencies) that it is a distinct possibility that nutritional deficiencies play a role in what we outwardly observe as the aging process. Do the aged with whom we work have these problems? That question has been approached many times, to try to determine the current nutritional status of the elderly population.

Research designs have dealt with nearly every facet of the nutritional spectrum, and different studies have found deficiencies in different areas. Some have suspected certain vitamins (such as A, B_1, B_2, B_6, B_{12}, C, D, and E) to be lacking, but have had mixed results and no generalizations can be made about them. Recently, some medical and government funded studies have chosen to limit their investigation to certain key areas, such as calcium, vitamin D, Iron, Zinc, Folate, and Thiamin (15). Indeed, among the large population studies calcium is fairly commonly found lacking, expecially in the female population (3). In fact, among women older than 35, more than 75% have daily intakes of calcium below Recommended Daily Allowance (RDA) standards (3). Perhaps coincidentally, but then again perhaps not, osteoporosis, the decreasing of bone mass, may affect as many as 25% of aging women in the United States (16). This disease also affects males, but not until a later age in life. I say perhaps coincidentally because there is no cause and effect relationship established between calcium and osteoporosis. But available studies indicate that patients with osteoporosis ingest less calcium than normal subjects (3).

One of the minerals often assumed deficient in the elderly is iron, and this is often measured by blood hemoglobin and hematocrit. However, these parameters are not accurate predictors of iron stores, though they may be useful determinants of anemia (7). Anemic states may or may not be caused by low iron stores, and low blood values of hemoglobin and hematocrit may not necessarily indict iron intake and storage. The body's need for iron is least in old age, and iron stores appear to be adequate for the elderly (7). In fact, review of studies has shown that the mean iron intake for the elderly is adequate, at least to age 75 (16). Past that age there is little data, not only for iron but other nutrients as well.

Another mineral of investigatory interest has been zinc, and mixed results are again found. Zinc deficiency may lead to poor taste acuity, poor wound healing, and immune dysfunctions, all of which are reasonably common in the aged population. On the average, the aged population receive enough zinc in the diet, but at least some elderly do not (11). This is found in a rather large percentage of the aged, and is dominant in some subpopulations.

Greater consistency of research results can be found when caloric intake is examined. When investigating the amount of food eaten, reviews have indicated that most studies have determined the caloric intake of the elderly to be below standards (4, 8, 16). The elderly simply do not eat enough. However, of some interest here, and perhaps contradicting a popular misconception, is that despite the low mean caloric intake, protein intake tends to be adequate. Even though in some cases the caloric intake is low, the amount of protein contained in that amount of food is adequate to meet their needs.

Also of some interest is the standard which was used for caloric intake - 2400 kcal for men and 1800 kcal for women - 1974 RDA standards. These seem relatively large, especially when we consider that energy expenditure decreases

21% between the ages of 21 and 74 (4). Plus the fact that % body fat increases with age. That caloric intake is often found below standard may be more a reflection of the research method than fact itself, and brings us to a very important consideration in examining nutritional status. Dietary information most often comes from a 1-3 day dietary recall diary. There is some doubt as to how well people remember and record content and portion size. Plus, how well does a short period of time reflect overall dietary habits? Further, different landmark studies have used different percentages of RDA standards to define "deficient". Some allowed shortcomings as great as 50% before they deemed a nutrient intake inadequate.

Closer examination of large population studies will indicate that, on the average, the elderly population is deficient in calories and calcium, and adequate in all other areas; but specific subgroups will differ. There are ethnic differences to consider, demographic differences, and differences in economic status. Plus the effect of lifestyle - institutionalized vs free living vs home bound. The bottom line is that no generalizations can be made about the aged population as a whole, and the specific subgroups you work with will have to be scrutinized. If all this has left you in a state of confusion about the nutritional status of the elderly, then I have successfully brought you up to the state of the art in nutritional research in the aged population.

While no generalization can be made as to the nutritional status of the aged persons you work with, there are some pretty clear signs of how these deficiencies got there, and what the currently healthy must be on guard for. These have been outlined quite well by Lamay (4) and Young (16).

First, there are some common physiological changes - decreased breathing capacity, decreased vital capacity, increased airflow resistance, lowered basal metabolism, all coupled with decreased physical activity to bring about

a lowered total metabolic rate. There is a decrease in kidney function and the ability to eliminate waste products. Glucose tolerance declines with age. There are increases in adipose tissue. There is a decreased volume of digestive juices, decreased peristalsis, and decreased parietal cell hydrocloric acid. For reasons not totally understood, there is a decrease in the efficiency of absorption of nutrients. All of the taste modalities decrease in sensitivity with age. All these factors combined change the amount and type of food people should or will consume. If changes in the dietary plan are not made, then nutritional deficiencies may result.

Then there is physical disability - poor vision, arthritis, or orthopedic problems which may prevent the aged from shopping, preparing, or actually feeding themselves. Loss of teeth may lead to the inability to eat certain foods. These are common and seemingly unrelated to nutrition but they complicate the dietary pattern.

Diseases will also affect the person's ability to physically meet dietary requirements. Chronic diseases such as heart disease, diabetes, hypertension, and cancer may modify nutrient requirements and may profoundly affect how the body can use nutrients. More common communicable diseases will alter both the body's need for and ability to consume vital nutrients.

There are very powerful social and personal factors at work affecting nutritional status. Unfortunately, many of the elderly are lonely. They do not like to eat alone; they are not motivated to prepare an adequate meal for themselves; and they won't go out to eat alone. In those who may overcome these factors, many are often not well enough educated in nutrition to choose the right foods.

Of all the causes of nutritional deficiencies, the one probably most obvious to you will be poverty. The elderly comprise one of the poorest populations in the U.S. with more than 50% estimated to be economically deprived.

Where we find deficiencies in items such as zinc, which is a rather expensive nutrient to provide, there is a close relationship to the amount of money spent on food (11). Total caloric intake is also often an economic victim, and extremely low caloric intake may account for a majority of vitamin and mineral deficiencies.

And last but certainly not least, another cause of nutritional deficiencies is drugs. This includes prescription drugs and over the counter drugs, including alcohol. Many drugs interfere with digestion, absorption, excretion, and utilization of nutrients. The interaction of foods with drugs may be totally overlooked in the care of the elderly. Is this a problem of any magnitude in our society? While the elderly comprise 11% of the population, they consume about 25% of the drugs (16). So the food drug interaction may indeed play a role in nutritional deficiencies. To complicate matters, there may be separate drug to drug interactions which then cause a third reaction to food interaction. That is, drug A may react with drug B to form reaction C; then reaction C may react with a food to form another, different interaction. Again, this is of some concern, because of the large number of persons, expecially the institutionalized, who receive several drugs concomitantly. In nursing homes, almost 30% receive as many as 8 to 12 drugs daily.

These are at least some of the causes of nutritional deficiencies we may find in the aged. But there is a question that perhaps we should ponder before moving on to finding ways to do something about the situation. Are these potential causes of nutritional deficiencies biological processes? In other words, are they a natural function of time on the human cells and tissues? If we delete the immediately obvious physiological function and physical disability, we can see that these reasons are not necessarily biological in nature. They are sociological, or at least to some extent under our control.

It is even debatable as to whether or not the amount of physical disability and the degree of physiological change are purely biological - they may in fact be to some extent changable by our lifestyle.

Well, whatever the reason, what can be done about the situation? In those cases where there exists a nutritional problem, is there anything that can be done about it? Where a deficiency exists, a shortcoming, the most logical and obvious solution has been supplementation. This seems logical, because if one appears to be taking in too little, it would be simple to add more. And we most often think of this supplementation in the form of a pill or dietary additive. There is some research evidence to indicate that supplementation is effective. Calcium supplementation in women with clinical osteoporosis has slowed the rate of bone loss (5). The addition of zinc to the diet appears to facilitate wound healing in an elderly population (2). Vitamin C supplementation with elderly inpatients apparently causes increases in serum vitamin C and improves hemorrhaging.

However, if we give more thought to this idea of supplementation, we must ask "Do we have to supplement using a pill, especially a multivitamin which may add nutrients not needed in the diet"? Changing the makeup of the diet may alleviate any problem, simply by substituting foods high in that particular nutritional aspect. As mentioned previously, low caloric intake may be a primary cause of deficiencies; in those cases, food additions rather than food substitution would be the answer. In either case, it is a matter of knowledge on the part of the elderly as to the foods of choice. This is a place where our profession can help, and brings me to the next point.

Nutritional inadequacies in the elderly may not be problems of acute complication. Consider the following thoughts:

"One does not suddenly become old and then have to worry for the first time about optimal nutritional intake - the eating patterns established in youth and early adulthood appear to contribute in a substantial way to maintaining health in old age (10)."

"The chronic diseases of the elderly are clearly related, to some degree, to dietary patterns, often established in early life (4)."

"Ample evidence is now available supporting the belief that nutritional adequacy in very early life, even during gestation, can have an influence on well-being in later life (16)."

As we have been preaching with physical fitness for years, the best cure is prevention. So rather than supplementing the diet with pills and vitamins, perhaps we should be starting proper nutrition at a much earlier point. But, what is proper nutrition? In the last 50 years there has been a knowledge explosion in health and medicine. Medical technology has found cures for multitudes of diseases; we have tremendous knowledge about preventing maladies. What new breakthroughs have we had in basic nutrition? Virtually none! We didn't need breakthroughs; except for some modifications, nutritional advise is as simple and basic now as it was 50 years ago - eat moderate amounts of a balanced diet. But the American diet has been less than exemplary. In its 1977 report (13), the U.S. Senate Select Committee on Nutrition and Human Needs exposed some glaring abuses of food in this country, primarily from excesses and not deficiencies. This report says that Americans eat too much, and that it consists of too much fat, sugar, and salt. So some of our problems of nutrition in the elderly are a result of bad habits formulated from childhood. So how do we prevent them? Follow the Select Committees Guideline:

1. Avoid overweight by consuming only as much energy as is expended. This recommendation calls for a decreased caloric intake in the elderly, which has already been cited as a possible cause of nutritional deficiency. But increased energy expenditure is what fitness is all about - so we could have the best of both worlds by eating enough to supply the nutrients but expending enough to avoid overweight and overfat.

2. Increase the consumption of complex carbohydrates and "natural sugars" to account for 48% of energy intake. We live in a society where sugar is given as a reward, a gift; and it is an empty calorie. Our intake of sugars should come from those occuring naturally in fruits, for we also will get fiber, bulk, vitamins and minerals at the same time. And we need to increase the complex carbohydrates, those starches we have been told will go directly to fat. The Committee recommends this category take up 48% of the total intake. We know that carbohydrates are the most economical fuel source in terms of oxygen, and those people on exercise programs may need to think in terms of an even higher percentage.

3. Reduce overall fat consumption from about 40% to about 30% of energy intake. There is ample evidence of the relationship between fat and cardiovascular disease. It's obvious that the American diet is laden with fat, with its deep fried fast foods, and affluent abundance of animal meats. Of the 30% fats we do consume, the saturated fats, common in animal products, should be reduced to 10%, with polyunsaturated and monounsaturated fats balancing the rest. This figure of 30% fat should also be considered a maximum figure. There is still considerable controversy as to how little fat we can consume and remain healthy, going all the way down to Nathan Pritikins recommended 10% (9). And if we look at the Select Committee's 48% complex carbohydrates and the 30% fats, by subtraction we find 22% of the diet in protein. Inasmuch as the RDA's for protein intake have consistently declined over the past 20

years, a person with adequate caloric intake is probably getting plenty of protein. consequently, if we reduce fats further and concomitantly decrease or remain the same in protein intake, the percentage of carbohydrates in the diet will again go up.

4. Regarding the fats, and being more specific, the Select Committee suggests reducing cholesterol consumption to about 300 MG/day. The January release of the results of the National Heart, Lung, and Blood Institute's study (6) provided very incriminating if not conclusive evidence that what we suspected about cholesterol is true - higher cholesterol level, higher risk of heart disease. Statistically, high cholesterol is not a significant health factor to worry about in the aged population. But that's because the folks with high cholesterol died before they became an aged population! If we want an elderly group to work with, we'd better advocate adherence to these guidelines early in life.

5. And last but not least, the American public needs to reduce its consumption of sodium, from current levels to about 5 gm/day. The 5 gm/day figure, like many of these factors, is controversial. But we do know that there is some connection between sodium intake and hypertension. And this is one factor that can be altered in old age, as we see many elderly with hypertension controlling their disease with medication and/or low sodium diets. Of note here is that we quickly condemn salt and take away salt shakers. But it is <u>sodium</u> that we must beware of, and it is found as a preservative in most of the packaged foods we eat as well as being hidden in some other unsuspected places.

Physical fitness is a relatively new phenomenon in this country. Dr. Everet Smith, of the University of Wisconsin, has indicated that some of the physiological changes associated with aging may at least be slowed down by exercise (12). The dietary studies I cited earlier were, we can safely assume,

done on populations of currently inactive persons, who were probably inactive in a majority of their adult life. What would the numbers tell us about nutritional anomalies if we conducted research on a aged group that was currently active? We find these people daily, even those who start their programs after having an MI are now cycling cross country or are running marathons. And we know from Peter Wood's studies at Stanford that middle aged male runners have HDL lipoprotein fractions which resemble women 10 years younger (14). We can only guess that people such as these have no nutritional deficiencies. But there is a new and growing group of elderly in our future. Physical fitness has not been around long enough to tell us much about the carryover of the long term benefits into the sixth, seventh, and eighth decades. What will be the physical and nutritional breakdown of these people who started exercising early in life, continued into early adulthood, into their 30's, their 40's, their 50's, their 60's and even into their 70's?

For those people who are exercising, are there any special nutritional considerations? These people may be considered "athletes" in a strict sense, just as anyone else who exercises at any age. So the advice for them is virtually the same as at any other time in their life. What about the ever-popular protein supplements? Some research has been done with elderly on weight training programs, and have shown that the same <u>relative</u> strength gain can be expected at any age (1). But at <u>no age</u> has the use of protein supplementation been shown to be beneficial, unless the amount of work is <u>tremendously</u> great. This fact, combined with the finding that the majority of elderly have adequate intake of protein, indicates that there is no reason to advise the use of additional protein in the diet, either in the form of food substitutes or additives.

Probably even more popular is the use of vitamin megadoses. Earlier I mentioned that some elderly may have deficiencies in some vitamins and minerals; for those people, the supplementation of specific nutrients may be necessary. But there is no need for the generalized bombardment of the system with nutrients not known to be low, and in fact there may be some danger, as not enough is known about nutrient toxicity.

So I would make the following statement concerning vitamins and mineral supplementation for a person engaged in exercise - IF, and that's a capital if, the diet is balanced, adequate, and proper, and if no deficiency has been diagnosed, then no supplementation to the diet is needed. Certainly the body requires more vitamins and minerals (as well as other nutrients) when exercising. But if the caloric intake and caloric expenditure remain balanced, and the recommended %ages of protein, fats, and carbohydrates are maintained, then those extra vitamins and minerals will be provided in the diet. This is the case at any age, and the sooner and longer it is practiced, the better off the human condition will be.

In summary - on the average, the diet of the elderly in this country is adequate, except possibly in total caloric intake and the intake of calcium, which is more important for women than men. However, many deficiencies may exist in specific ethnic, demographic, and economic subpopulations. A number of factors might enter into causing these general and specific problems, of which drug to drug and drug to food interractions may be supreme. But we cannot rule out the role of economic status, and we must remember that there is undoubtedly an entire subpopulation of the aged who cannot afford to exercise because they simply cannot afford the extra caloric intake. While we cannot solve the economic problems of the world, there are things we can do to help

alleviate nutritional problems. Some diagnosed deficiencies may be remedied by supplementation, either in the form of dietary additives or substitutions. The implementation of additives belongs to the medical community and the dieticians. However, much can be done by teaching proper dietary habits, starting early in life and continuing through the greying years. This does fall within our realm, as recreation programs can greatly influence habits. And finally, the combined professions of HPERD may be responsible for changing the next generation of elderly by fostering a lifetime of activity and fitness. There is every indication that the active lifestyles, combined with the practice of available nutritional guidelines, as well as compliance with other components of a wellness program, will enhance at least the quality if not the quantity of our existence. Just as nutrition and fitness are integral parts of a wellness program, we must continue to establish our place as integral parts of the healthy life of the nations population.

TABLE 1

FUNCTIONAL CHANGES WITH AGING

Functional Declines In:

Work Capacity	Cardiac Output
Heart Rate	Blood Pressure
Respiration	Basal Metabolism
Musculature	Lean Body Mass
Flexibility	Bone Mass
Total Body Water	

TABLE 2

SYMPTOMS OF AGING

Anxiety	Irritability
Memory Loss	Nervousness
"Pseudo-Senility"	Depression
Breathlessness	Weakness
Difficulty in Walking	
Muscular Weakness	

TABLE 3

POSSIBLE CONSEQUENCES OF NUTRITIONAL DEFICIENCIES

DEFICIENCY IN:	CONSEQUENCES:
Vitamin B	anxiety, irritability, loss of memory, nervousness, depression pseudo-senility
Vitamin D	bone pain, difficulty in walking, muscle weakness
Foalte	breathlessness, weakness

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